

RECORD OF COMMUNICATION	X	PHONE CALL		CONFERENCE	DATE: August 2, 2006
	X	DISCUSSION	X	OTHER	TIME:
TO: Record Melinda Nickason					FROM:
SUBJECT: Derivation of a 48h SMAV for <i>Menidia beryllina</i> for use in a streamlined method for marine copper WER studies in Texas.					

GENERAL SUMMARY:

In early 2006, a cooperative effort between EPA WQS staff and TCEQ WQS staff to determine a 48h SMAV for *Americamysis bahia* to be used in a streamlined method for marine copper WER studies was completed. A 48h SMAV of 378.33 ug/L for *A. bahia* was determined from the geometric mean of 72 48h-LC50s (from reference toxicant tests using copper nitrate conducted by PBS&J). However, as part of the streamlined method for marine copper WER studies, EPA WQS staff recommended that the initial round of testing also include testing with *M. beryllina* (96h tests because the SMAV for *M. beryllina* is based off of 96h tests) in order to ensure the more sensitive of the two species was utilized in the WER study.

Following this effort, we received a request from TCEQ about the possibility of conducting 48h hour tests with *M. beryllina*, rather than 96h tests. EPA WQS staff explored this possibility during the spring and summer of 2006. The main issue: the only SMAV put forward by EPA for *M. beryllina* (in the draft 2003 Copper Criteria Document) is based upon a 96h test. In the streamlined WER approach, it is necessary to compare the laboratory LC50 with the SMAV for the species being tested in the WER study. How could a 48h laboratory derived LC50 be compared with a 96h SMAV? Therefore, in order to utilize 48h testing with *M. beryllina* in a streamlined approach, it is necessary to determine a scientifically defensible 48-h SMAV for *M. beryllina* to which the laboratory LC50 value could be compared.

The information below provides additional detail as to the steps taken in determining whether (and how) a 48h toxicity test for *M. beryllina* would be appropriate for use in a streamlined WER method for copper in marine waters.

DETAILED SUMMARY:

BACKGROUND: The 96-h SMAV found in the draft 2003 copper criteria document for *M. beryllina* is based off a WER study conducted in California back in 1991. The individual study reports are called ToxScan A, B, and C. The three 96-h LC50s found in these reports are 115.41 ppb, 96.5 ppb, and 123.04 ppb. The 96-h SMAV (111.1 ppb) for *M. beryllina* is the geometric mean of these three 96-h LC50s.

TOXSCAN: EPA WQS staff obtained electronic copies of the three ToxScan reports (through a series of "who knows who" emails) from Peter Schaefer, a biologist with the City of San Jose. The objective

was to be able to locate the copper concentrations associated with mortality at 48 hours and then calculate what would have been the 48-h SMAV for *M. beryllina*. The data was available; however, the three 48-h LC50s for *M. beryllina* were almost identical to the 96-h LC50s, meaning that the 48-h SMAV would be almost identical to the 96-h SMAV. Peter mentioned that changes in EPA protocol (e.g. feeding) might account for these results.

STILLMEADOW: At this point, EPA WQS staff contacted TCEQ WQS staff to ask whether 48-h LC50 data for *M. beryllina* was available from Texas labs whose tests utilized copper sulfate. The 1995 Copper Saltwater Addendum cited copper sulfate as the toxicant used in the ToxScan tests. A geometric mean of the 48-h LC50 data from Stillmeadow produced a 48-h SMAV for *M. beryllina* of ~650 ppb, almost 6 times higher than the geometric mean of the three 48-h LC50 values from the ToxScan study.

DIFFERENCES BETWEEN STILLMEADOW AND TOXSCAN 48-h LC50 VALUES: In trying to determine the source of this difference, and whether the difference was acceptable, EPA WQS staff wanted to compare Stillmeadow's 96-h LC50 values with the ToxScan 96-h LC50s. At this point EPA WQS staff contacted TCEQ WQS staff asking whether Stillmeadow had 96-h data and how they derived their LC50 values (measured or extrapolated). TCEQ WQS staff then forwarded the reply from Stillmeadow saying that they didn't have the 96-h data easily available and that they extrapolated the data using Probit to determine the LC50 values.

Peter Schaefer believed that the difference between the ToxScan results and the Stillmeadow results may have been due to differences in the EPA protocols over time. EPA WQS staff also believed that the differences could be due to the fact that the Stillmeadow 48-h LC50 values are **extrapolated using probit** rather than from measured values.

OPTIONS CONSIDERED AT THIS POINT IN THE PROCESS:

For saltwater copper WERs, the first round of testing would run a 48h test on *A. bahia* and a 96h test on *M. beryllina*. Since the 48h LC50 can be derived from a 96h test, the 48h LC50 for *A. bahia* can be compared with a 48h LC50 on *M. beryllina* to determine which is the most sensitive species.

If *A. bahia* is determined to be most sensitive, then the second round of testing would consist of a 48h test with *A. bahia*. Each WER would be calculated by dividing the site water LC50 by the greater of the lab water LC50 or the 48h SMAV that we derived for *A. bahia* (378.33 ug/L). The final WER would be the geometric mean of the 2 individual WERs.

If *M. beryllina* is determined to be the most sensitive, then the second round of testing would consist of a 96h test with *M. beryllina*. (The first round would have already been conducted at 96h.) Each WER would be calculated by dividing the site water LC50 by the greater of the lab water LC50 or the 96h SMAV for *M. beryllina* as found in the draft 2003 copper criteria document. The final WER would be the geometric mean of the 2 individual WERs.

PROBLEMS WITH THIS OPTION:

Issue I: If during the first round of WER testing, a 48h test were run with *A. bahia* and a 96h test were run with *M. beryllina*, in order to adequately compare sensitivities of the two species at 48 hours, the test with *M. beryllina* would probably need to be run with additional dilutions in order to properly bracket the LC50 concentrations at both 48 hours and 96 hours. [And, as is usually already done with the 96h tests, it should be ensured that copper concentrations and mortalities are also measured and recorded at 48 hours in order to determine the 48h LC50 for *M. beryllina* for comparison with the 48h LC50 for *A. bahia*.]

Issue II: There is an issue with utilizing the streamlined copper WER guidance in marine water regardless of whether they are 48h or 96h tests. The 96h SMAV in the draft 2003 copper criteria document for *A. bahia* is based on tests using copper nitrate (which is why the 48h SMAV that was derived previously uses copper nitrate as the toxicant). However, the 96-h SMAV for *M. beryllina* was derived using copper sulfate (according to the 1995 saltwater copper addendum). So, whether the option presented above is utilized or 96h testing for both the invertebrate and vertebrate is utilized, then the result would still be with a test with *A. bahia* that uses copper nitrate as the toxicant and a test with *M. beryllina* that uses copper sulfate as the toxicant. How can species sensitivities be compared (even if they are at the same duration) based upon two different toxicants? Conversely, if the same toxicants are used in the tests with the vertebrate and invertebrate, then how can each species' LC50 be compared with the SMAV, since one of the two species would have been tested with a different toxicant than used in the study upon which the SMAV is based?

DATA COMPILATION: Six marine copper WER studies in Texas have been completed and approved by EPA in the past. These six studies utilized *A. bahia* and *M. beryllina* as the invertebrate and vertebrate test species, respectively. Four of the studies utilized copper nitrate as the toxicant, one of the studies utilized copper sulfate, and another utilized copper chloride. EPA WQS staff compiled the laboratory water LC50 results from these six studies in order to examine any patterns in the data which might point to which species was more sensitive at 48 hours and for which toxicant. Another objective of this data compilation was to determine a potential geometric mean 48h LC50 value (SMAV) for *A. bahia* and *M. beryllina*, as well as a geometric mean 96h LC50 value (SMAV) for *M. beryllina* based off of tests which utilized the same toxicant. The results from this data compilation and a summary of the results can be found in a separate Microsoft Excel file titled "Past Marine Cu WER Study Results.xls".

OPTIONS TO CONSIDER:

Three options to consider for moving forward (given the results of the data compilation effort) are provided in the Excel file referenced above.

CONCLUSION:

To be determined following a conference call with TCEQ.

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